

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS  
FOR RECONSTRUCTION OF  
MASSEK STREET SEWER  
SUPPLEMENTARY TO ITEM HT.5 AND HT.7b  
(CONTRACT)

HARTFORD, CONNECTICUT

DECEMBER 17, 1941

CORPS OF ENGINEERS, U. S. ARMY  
U. S. ENGINEER OFFICE      PROVIDENCE, R. I.

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WAR DEPARTMENT  
UNITED STATES ENGINEER OFFICE  
PROVIDENCE, R. I.

APPROPRIATION: 21X3113 FLOOD CONTROL, GENERAL

RECONSTRUCTION OF MASSEK STREET SEWER  
SUPPLEMENTARY TO ITEMS Ht.5 AND 7b (CONTRACT)  
HARTFORD, CONNECTICUT

S P E C I F I C A T I O N S

SECTION I. GENERAL PROVISIONS

1-01. Location. - The site of the work covered by these specifications is located on the west bank of the Connecticut River in the central and south portions of the City of Hartford, Connecticut.

1-02. Work to be done. - a. The work provided for herein is authorized by the Flood Control Act of June 23, 1938 (Public No. 761, 75th Congress).

b. The work to be done consists of furnishing all plant, labor, and materials and performing all work required for the reconstruction of a 6-foot sewer in the vicinity of Station 56+50 of the Riverfront Dike, involving placing of reinforced concrete pipe and construction of a concrete gate structure, complete in accordance with these specifications and the drawings forming a part hereof, together with such incidental work as needed or ordered in writing by the contracting officer.

1-03. Description of the work. - The sewer will be constructed of reinforced concrete pipe, laid on precast concrete sleepers and a bedding of gravel. The outlet will be controlled by a backwater gate and hoist, housed in a reinforced concrete gate structure as shown on the drawings. Existing structures will be removed only to the extent necessary for sewer reconstruction, and the abandoned sections of the existing sewer line will be backfilled.

1-04. Drawings. - a. The work shall conform to drawings marked, "Supplemental Agreement, Reconstruction of Masseek Street Sewer, Hartford, Connecticut," as listed below, which drawings form a part of these specifications and are filed in the United States Engineer Office, Providence, Rhode Island.

LIST OF DRAWINGS

<u>Sheet No.</u>	<u>Title</u>	<u>File No.</u>
1	General Plan and Index	CT-4-3055
2	Plan and Profile	CT-4-3062
3	Details	CT-4-3063
4	Backwater Gate Chamber	CT-4-3064
5	Steel Reinforcement Schedule	CT-4-3121

Ten sets of prints of all necessary contract drawings will be furnished without charge, upon request by the contractor. Additional prints will be furnished upon request at the cost of printing.

b. The work shall also conform to such other drawings relating thereto as may be exhibited in the office of the contracting officer prior to the opening of proposals, and to such drawings used in explanation of details as may be required from time to time during construction, including such minor modifications as the contracting officer may consider necessary on account of conditions discovered during the prosecution of the work.

c. Prior to performing the work, the contractor shall check all drawings and shall immediately report to the contracting officer any errors or omissions discovered therein. Quantities stated in bills of material on contract drawings are approximate, and the contractor shall furnish the required quantity without change in unit price. All items to be furnished at lump sum prices shall be provided by the contractor, complete and in good working order, regardless of whether or not they are fully shown or listed on the contract drawings. Parts and details not fully indicated on the drawings shall be detailed by the contractor in accordance with standard engineering practice. Four copies of each

drawing shall be submitted to the contracting officer for approval. Each sheet of drawings submitted for approval shall be provided with a blank white space approximately 5 inches by 4 inches near the lower right-hand corner, just above the title, in which the contracting officer may indicate the action taken. After approval by the contracting officer, but before the work indicated on the contractor's drawings is commenced, one copy of each approved drawing will be furnished the contractor. These approved drawings shall form a part of the contract. The Government will not be responsible for minor errors or minor discrepancies in the contract drawings, nor for errors in the contractor's drawings, even though approved. Drawings furnished by the contractor for approval by the contracting officer shall be made with ink on tracing cloth. Upon completion of the project, the contracting officer shall be furnished with "Van Dyke" negatives of the contractor's drawings, corrected to show all revisions made during construction. Payment for contractor's drawings, revisions thereof, and for copies furnished shall be included in the contract prices for material or work.

1-05. Quantities. - The following estimate of quantities is given to serve as a basis for determining the approximate consideration of the contract. Within the limits of available funds, the contractor will be required to complete the work specified in Paragraph 1-02, whether the required quantities are more or less than the amounts herein estimated, and final payment will not be made until the work is so completed.

<u>Item No.</u>	<u>Designation</u>	<u>Unit</u>	<u>Quantity</u>
1	Common Excavation - General	cu.yd.	6,100
2	Removal of Existing Structures	job	-
3	Gravel Bedding	cu.yd.	250
4	Compacted Backfill	cu.yd.	4,200
5	Dumped Rock Fill	cu.yd.	500
6	Reinforced Concrete Pipe	lin.ft.	168
7	Precast Concrete Sleepers	cu.ft.	850
8	Cement	bbl.	210
9	Concrete, Class "A"	cu.yd.	150
10	Steel Reinforcement	lb.	13,000
11	Flap Valves - 12-inch	each	2
12	Miscellaneous Iron and Steel	lb.	750
13	Copper Water Stops	lb.	70
14	Backwater Gate, Complete with Hoist	job	-

1-06. Physical data. - a. General. - Materials for constructing the backfill are available in the vicinity of the work. It is expressly understood that the Government will not be responsible for any deduction, interpretation, or conclusions made by the contractor from his inspection of the available drawings and records. The contract drawings represent all the pertinent information which the Government has available for work at the site. Concrete aggregates, riprap, and gravel or brushed stone for bedding shall be obtained from sources approved by the contracting officer.

b. Transportation facilities. - (1) Railroads. - The New York, New Haven and Hartford Railroad serves the City of Hartford with main and branch line traffic. The contractor shall investigate the availability of the sidings from the railroad company and make all arrangements with the latter for the use of any sidings for the delivery of any materials and equipment to be used on the work.

(2) Highways. - First-class highways also serve the city. The contractor shall provide for his own construction or access roads and their maintenance. He shall make his own investigation of available roads for transportation, load limits for bridges and roads, and other road conditions affecting the transportation of materials and equipment to the site of the work.

(3) Waterways. - A 15-foot channel with 94-foot minimum vertical clearance is maintained in the Connecticut River up to the highway bridge at Hartford, which is above the upper limit of the proposed work. Above the bridge there is limited draft and overhead clearance. For navigation data see U. S. C. & G. S. Charts Nos. 215, 254, 255, and 256. The normal river stage is 3.5 feet mean sea level at the Hartford Bridge, and usually varies from a low stage of 1.5 feet mean sea level in August to a high stage of 20+ feet mean sea level in April. Freshets producing higher stages may occur at any month of the year as a result of heavy rainfall.

c. Weather conditions. - The locality is subject to atmospheric temperatures ranging from minus 18 degrees to plus 101 degrees F. The mean annual precipitation at Hartford is 43.38 inches. The mean monthly precipitation varies from a low of 3.32 inches in June to a high of 4.19 inches in August.

1-07. Commencement, prosecution, and completion. - a. The contractor will be required to commence the work under the contract within ten (10) calendar days after date of receipt by him of notice to proceed, to prosecute the said work with faithfulness and energy, and to complete the entire work within 90 calendar days after said date of receipt of notice to proceed.



b. The contracting officer may, at his discretion, suspend work for the period during which sub-freezing temperatures are experienced or are reasonably to be expected, ground moisture conditions are unfavorable, or the water surface in the river exceeds elevation of 15.0 feet at Station 56+00. The contractor will be required to resume operations on written notice from the contracting officer terminating the suspension, provided that a maximum of 3 days after receipt of notice will be allowed before it becomes effective. The time allowed for completion of the entire work is exclusive of any time that may intervene between the effective date of orders of the contracting officer to suspend operations and the effective date of orders to resume the work.

c. If the completion of the undertaking to be performed under the terms of this contract be delayed by reason of delay in the delivery of materials or supplies essential to such performance because of national defense priorities and without the fault or negligence of the contractor, the time of performance will be extended for a period equal to such delay, as determined by the contracting officer, and subject to appeal, as provided in Article 9 of the contract.

d. Liquidated damages. - In case of failure on the part of the contractor to complete the work within the time determined and agreed upon for its completion, plus any extensions duly granted under the terms of the contract, the contractor shall pay the Government, as liquidated damages for delay in completing the entire work under the contract, the sum of fifty dollars (\$ 50.00) for each calendar day of delay until all work is completed or accepted.

1-08. Sundays, holidays, and nights. - No work shall be done on Sundays or on days declared by Congress as holidays for per diem employees of the Government except in cases of emergency, and then only with the written consent of the contracting officer. Work may be done at night when authorized in writing by the contracting officer.

1-09. Progress, organization, and plant. - a. The contractor shall employ, at all times, an ample force of men with proper experience in their respective assignments and provide equipment and a construction plant properly adapted to the work, and of sufficient capacity and efficiency to accomplish the work in a safe and workmanlike manner within the time specified in Paragraph 1-07. All plant and equipment shall be maintained in good working order, and provision shall be made for immediate emergency repairs. The contracting officer may order the removal and require replacement of any unsatisfactory plant or equipment. No reduction in the capacity

of the plant employed on the work shall be made, except under written permission of the contracting officer. The measure of "capacity of the plant" shall be its actual performance on the work to which these specifications apply. It is understood that award of this contract shall not be construed as a guarantee by the Government that the plant and equipment listed by the contractor in the bid form are adequate for the performance of the work.

b. Should the contractor fail to maintain a rate of progress which will insure completion of the work within the time specified in Paragraph 1-07, the contracting officer may require that additional men, equipment, or plant be placed on the work, or a reorganization of the plant layout be effected in order that the work be brought up to schedule and maintained there. Should the contractor refuse or neglect to comply with these requirements to the satisfaction of the contracting officer, the contracting officer will proceed under the provisions of Article 9 of the contract.

1-10. Payments and assignments. - a. Payments. - (1) Payments will be made monthly in accordance with Article 16 of the contract, provided that where, in the opinion of the contracting officer, the attendant circumstances are such as to warrant such action, payments may be made semi-monthly, or on a monthly basis other than the calendar month.

(2) Payments will be made in accordance with the contract unit prices indicated in the accepted bid, subject to necessary adjustments as listed in this contract on account of partially completed work under another contract or partial payments for material.

b. Assignment of claims. - Claims under this contract may be assigned in accordance with the Assignment of Claims Act of 1940 if payments hereunder will aggregate \$1,000 or more, subject to the following added provisions:

(1) Any assignment shall cover all amounts payable under this contract and not already paid and shall not be made to more than one party, except that any such assignment may be made to one party as agent or trustee for two or more parties participating in such financing.

(2) Any claim under this contract which may be assigned may be subject to further assignment to a bank, trust company, or other financial institution, including any Federal lending agency, and to similar further assignment; provided that any such assignee shall file written notice of the further assignment together with a true copy of the instrument of further assignment with the contractor and also as provided in proviso 4 of section 1 of the Assignment of Claims Act of 1940 (Public No. 811, 76th Congress) in respect of original assignment. No assignee shall divulge any information concerning the contract, or contained therein, except to those persons necessarily concerned with the transaction.

(3) Payments to an assignee of any claim arising under this contract shall not be subject to reduction or set off for any indebtedness of the assignor to the United States arising independently of this contract.

1-11. Work covered by contract price. - The contractor shall, under his contract prices, furnish and pay for all material, equipment, and labor, and all permanent, temporary, and incidental work, furnish all accessories, and do everything that may be necessary to carry out the work specified in good faith, which contemplates everything specified completed, in good working order, of good materials with accurate workmanship, skillfully fitted and properly connected and put together (see Paragraph 1-13).

1-12. Tax adjustments. - The contract price will be considered to include all Federal, State and local taxes imposed prior to the date of opening bids and applicable to the undertaking. If any privilege, sales, gross receipt or other tax (exclusive of taxes on net income or undistributed profits), applicable to the undertaking and payable directly by the contractor, is imposed or changed by Federal or State enactment after the date of acceptance of the contract, then the contract price will be increased or decreased accordingly, and any amount due or chargeable against the contractor as a result thereof will be adjusted on payment vouchers as separate items.

1-13. Material to be furnished by the contractor. - The contractor shall furnish all materials and equipment necessary to complete the work to be done under these specifications. The cost of unloading and loading, handling, hauling, storing, and caring for materials furnished by the contractor shall be included in the contract prices for the work to which the materials pertain. All materials, supplies, and articles delivered at the site shall be adequately housed or otherwise protected against deterioration and damage.

1-14. Order of work. - The work shall be carried on at such places and also in such order of precedence as may be found necessary by the contracting officer. The contractor shall submit, for approval of the contracting officer, his proposed program in writing giving the sequence of construction operations contemplated. The location and limits of the work to be done will be plainly indicated by stakes, lines, marks, or otherwise as established by the contracting officer or his agents.

1-15. Damage. - Damage to Government property due to the failure of the contractor to take reasonable precaution, and all loss or deterioration of, or damage to any of the work by flood, accident or exposure prior to final acceptance of the work, shall be made good by the contractor without expense to the Government, except that the Government will compensate the contractor for repairs to the permanent work, if damaged by flooding or scouring through no fault of the contractor.

1-16. Patents. - The contractor shall hold and save the Government, its officers, agents, and employees harmless from liability of any nature or kind, including costs and expenses, for or on account of any patented or unpatented process or invention, article, or appliance manufactured or used in the performance of this contract, including its use by the Government.

1-17. Grounds and right of way. - a. Grounds and right of way, needed for the work to be done under these specifications will be furnished by the Government. The Government shall not be held liable for any delay in furnishing the grounds or right of way, but in case such delay retards the operations of the contract, the contracting officer will grant an extension of time for the completion of the work equal to the length of the delay (see Paragraph 1-07). The contractor will have the privilege of using the Government-controlled land at the site, not otherwise reserved by the contracting officer; provided that plans for all construction, storage, or other operations proposed thereon by the contractor are submitted for approval of the contracting officer prior to the occupation of such areas.

b. The contractor, without expense to the Government, at any time during the progress of the work and when space is needed for other purposes, shall vacate promptly and clean up any part of the grounds allotted to or in use by him, when directed to do so by the contracting officer.

1-18. Removal of rubbish. - The contractor shall keep the site free from rubbish. Suitable spoil areas for receiving refuse from the grounds shall be provided by the contractor, and the rubbish shall be removed and disposed of as directed by the contracting officer. At the conclusion of the work, the site shall be cleaned up and all rubbish and unused materials shall be removed.

1-19. Obstruction and danger lights. - In the contractor's use of streets and highways, for the work to be done under these specifications, he shall conduct his operations as approved by the contracting officer and in accordance with State and local laws and regulations. The contractor shall provide, erect and maintain effective barricades, danger signals, and signs on all intercepted roads or highways, and on the site where directed by the contracting officer for the protection of the work and safety of the public. All barricades, obstructions and plant which encroach on or are adjacent to public rights of way shall be provided with lights at night and all such lights shall be kept burning between sunset and sunrise. Such barricades and lights shall conform to the local and State laws. The contractor shall be responsible for all damages resulting from any neglect or failure of these requirements. The expenses of these and other safety precautions shall be borne by the contractor.

1-20. Inspection and supervision. - a. General. - The work will be conducted under the general direction of the contracting officer, and will be inspected by inspectors appointed by him who will enforce a strict

compliance with the terms of the contract. The contracting officer will furnish, on request of the contractor, all location and limit marks reasonably necessary as provided in Paragraph 1-22. The inspectors will keep a record of work done, and see that the location and limit marks are kept in proper order. The presence of an inspector shall not relieve the contractor of his responsibility for the superintendence required in the proper execution of the work (see Article 8 of the contract). Tests to determine the quality and fitness of material used and work done under these specifications will be made as indicated under that part of the specifications pertinent to the particular kind of work, and as stated in Paragraph 1-36.

b. Facilities to be furnished. - (1) The contractor shall furnish promptly, in accordance with Article 6 of the contract, all facilities, labor, and materials necessary for the safe and convenient inspection and tests that may be required by the contracting officer.

(2) The contractor shall furnish a room, approximately 10 by 12 feet in size, at his concrete mixing plant for a Government laboratory, to be used for making field tests including the moisture content of aggregates and such other field tests as are prescribed in these specifications under Section IV and for temporary storage of concrete specimens. The room shall be protected from the weather, properly lighted, and heated, all of which together with the location and capacity shall be subject to the approval of the contracting officer. The contractor shall provide electricity in accordance with Paragraph 1-33.

(3) The contractor shall furnish appropriate quarters for a Government field office. Such quarters shall be a room approximately 10 by 12 feet in size, and otherwise shall conform to the provisions of subparagraph (2) above.

(4) No separate payment will be made to the contractor for providing these facilities. Should the contractor refuse, neglect, or delay compliance with the requirements concerning facilities for inspection and for furnishing the Government field office, the specified facilities may be furnished and maintained by the Government, and the cost therefor will be deducted from any amounts due or to become due to the contractor.

c. It is hereby understood and agreed that any instructions or decisions by a superior officer through the contracting officer are to be considered instructions or decisions of the contracting officer in all cases under the terms of the contract where decision rests with the contracting officer.

1-21. Datum and bench marks. - The plane of reference used in these specifications and on the drawings hereof is mean sea level datum. Elevations in feet as specified and as shown on the drawings are to be determined from a bench mark located near the site of the work, the location, description, and elevation (in feet) of which is as follows:

"Hartford - at north entrance to Post Office, on east side of steps, about 2 feet above sidewalk, standard disc in the upper surface of granite guard block; designated also as Tidal Bench Mark 5 - 62.417 feet above mean sea level."

1-22. Lines and grades. - a. The contractor shall keep the contracting officer informed a reasonable length of time in advance of the time and places at which he intends to do work in order that lines and grades may be given, necessary measurements for record and payment made, and progress photographs taken with a minimum of inconvenience to the contracting officer or of delay to the contractor, and the contractor shall have no claim for damages or extension of time on account of delays in giving of lines and grades or due to destruction of such marks and the consequent necessity for replacement.

b. All lines and grades will be given by the Government inspectors as authorized representatives of the contracting officer, but the contractor shall provide at his own expense such temporary structures and such materials and give such assistance as may be required by the contracting officer and the marks given shall be carefully preserved. After lines, elevations and grades for any part of the work have been given by the contracting officer, the contractor will be held responsible for the proper execution of the work to such lines, elevations, and grades, and all stakes or other marks given shall be preserved by the contractor until their removal is authorized by the contracting officer. The contracting officer may require the work to be suspended when for any reason such marks cannot be properly followed.

1-23. Interpretation of specifications. - The contracting officer shall decide all questions which may arise as to the performance, quantity, quality, acceptability, fitness, and rate of progress of the several kinds of work to be done or materials to be furnished under this contract. He shall decide all questions which may arise as to the interpretation of the specifications and of drawings used and as to the fulfillment of this contract on the part of the contractor, and as to defects in the contractor's work. His determination and decision shall be final, subject to appeal as provided for in Article 15 of the contract and Paragraph 1-32 of these specifications.

1-24. Water supply. - The contractor shall provide, at convenient points, ample supplies of water of proper quality for all the operations required under this contract.

1-25. Use of explosives. - The contractor shall use the utmost care, in the use of explosives necessary for the prosecution of the work, not to endanger life or property. All blasting operations shall be conducted by experienced men only. The handling and use of explosives shall be done strictly in accordance with the latest methods and rulings to insure safety, in accordance with the specifications issued by the U. S. Bureau of Mines, and in compliance with the local and State laws. Failure to

observe necessary precautions will be sufficient grounds for temporary suspension of the work. All explosives shall be transported and stored in a secure manner, and in accordance with local and State laws; all vehicles and such storage places shall be marked clearly "DANGER - EXPLOSIVES", and shall be in the care of competent watchmen at all times. In no case shall caps or other detonators be stored or transported with dynamite or other explosives. The location of magazines for the storage of explosives and for the separate storage of detonators shall be subject to the approval of the contracting officer.

1-26. Standard stock products. - All material, supplies and articles furnished shall, wherever so specified and otherwise wherever practicable, be the standard stock products of recognized reputable manufacturers. The standard stock products of manufacturers other than those specified will be accepted if, in the opinion of the contracting officer, they are equal in strength, durability, usefulness and convenience for the purpose intended. (See Article 7 of the contract.) Any changes required in the details and dimensions shown on the drawings for the substitution of standard stock products, other than those provided for, shall be properly made as approved by the contracting officer, and at the expense of the contractor.

1-27. Safety requirements. - a. The contractor shall make all necessary provisions to protect the public safety, and to maintain and protect existing structures of whatever kind, and shall repair all damages done to such structures. He shall give ample notification to the proper officials of any city or town and of any public utility or other corporation before entering upon their respective public ways or rights of way to perform the required work of construction. Such construction shall conform to the customary regulations and requirements of said officials or corporations. The contractor shall give all notices, take out all permits, and pay all such charges, fees, water and other rates that may be necessary in the carrying out of the work.

b. The contractor shall be responsible that his employees observe the laws of the United States affecting all operations at the site under the contract. He shall comply with all applicable Federal and State laws under which he is operating, including those concerning the inspection of boilers and other equipment, and the licensing of engineers, welders and other employees.

c. The contractor shall conduct the work with due regard for adequate safety and sanitary requirements and shall maintain his plant and equipment in safe condition. He shall conform to current safety and engineering practices as set forth in the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America; the publications of the National Safety Council, and with all applicable State or local safety and sanitary laws, regulations and ordinances.

d. The contracting officer will require such safety and sanitary measures to be taken as the nature of the work and the conditions under which it is to be performed demand. Such measures shall include:

(1) The provision of adequate extinguishers or fire-fighting apparatus in and about all buildings and plant erected or used at the site of the work.

(2) Adequate first aid and life-saving equipment.

(3) Adequate illumination during night operations.

(4) Instruction in accident prevention to reach all employees.

(5) Such machinery guards, safe walkways, scaffolds, ladders, bridges, gangplanks, and other safety devices, equipment, and apparel as are necessary to prevent accidents or injuries.

(6) The provision of watchmen and flagmen at railroad crossings and street intersections where traffic may be affected by the contractor's trucking operations and for the protection of the contractor's forces adjacent to or within the railroad right of way.

e. The contractor shall report promptly to the contracting officer, in form prescribed by him, all accidents occurring at the site of the work.

f. The contracting officer will notify the contractor in writing of any non-compliance with the foregoing provisions and the corrective action to be taken. If the contractor fails or refuses to comply promptly, the contracting officer may issue a stop order suspending all or any part of the work. Such stop order will be sent by registered mail to the contractor at the site of the work and shall be accepted by him as sufficient notice thereof. Work will thereupon be suspended as directed. When satisfactory corrective action is taken, a resumption order will be issued. No part of the time lost due to any such stop order shall be made the subject of a claim for extension of time or for excess costs or damages by the contractor.

1-28. Access to work. - The contracting officer, his authorized representative and other duly authorized agents and employees of the Government may at all times enter upon the work and premises used by the contractor, or into his works or shops. The contractor shall provide safe and proper facilities for such entrance and for the inspection of materials and workmanship.

1-29. Interference with other contractors. - The contractor shall be subject to Article 13 of the contract regarding interference with materials, appliances or employees of the Government or of any other



contractor who may have work at the site. As far as practicable, all contractors shall have equal rights to the use of all roads and grounds. In case of disagreement regarding such use, the decision of the contracting officer shall govern, subject to appeal under Article 15 of the contract.

1-30. Purchase of supplies and materials. - a. Preference for domestic articles. - (1) Because the materials listed below or the materials from which they are manufactured are not mined, produced, or manufactured, as the case may be, in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality, their use in the work herein specified (subject to the requirements of the specifications) is authorized without regard to the country of origin:

Platinum	Nickel	Asbestos
Chromium	Rubber	China wood oil (tung oil)
Cork	Teakwood	Balsa wood
Jute	Sisal	English ball clay
Kauri gum	Silk	English china clay
Lac	Tin	Natural copper-nickel alloy

(2) Articles, materials, or supplies manufactured in the United States and containing mercury, antimony, tungsten, or mica of foreign origin may be used (subject to the requirements of the specifications) in the work herein specified, because such manufactured articles, materials, or supplies have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced, or manufactured, as the case may be, in the United States.

b. Purchasing procedure. - Two copies of all purchase orders showing firm names and addresses, and of all shipping bills or memoranda of shipments received showing car initials and numbers, when shipped by railroad, shall be furnished promptly to the contracting officer. Such orders, shipping bills or memoranda shall clearly indicate weights, and shall be so worded or marked that each item, piece or member can be definitely identified on the drawings.

1-31. Minor modifications. - The right is reserved to make such minor changes in the execution of the work to be done under these specifications as, in the judgment of the contracting officer, may be necessary or expedient to carry out the intent of the contract; provided that the unit cost to the contractor of doing the work shall not be increased thereby, and no increase in unit price over the contract rate will be paid to the contractor on account of such changes.

1-32. Claims, protests, and appeals. - a. If the contractor considers any work demanded of him to be outside the requirements of the contract, or if he considers any action or ruling of the contracting officer or of the inspectors to be unfair, the contractor shall, without undue delay, upon such demand, action, or ruling, submit his protest

thereto in writing to the contracting officer, stating clearly and in detail the basis of his objections. The contracting officer shall thereupon promptly investigate the complaint and furnish the contractor his decision, in writing, thereon. If the contractor is not satisfied with the decision of the contracting officer, he may, within thirty days, appeal in writing to the Chief of Engineers, whose decision shall be final and binding upon the parties to the contract. Except for such protests or objections as are made of record in the manner herein specified and within the time limit stated, the records, rulings, instructions, or decisions of the contracting officer shall be final and conclusive.

b. The Chief of Engineers has been designated by the Secretary of War as his duly authorized representative to make final decision and to take other action where the terms of the contract require that such decision or action shall be "by the head of the Department concerned or his duly authorized representative". All appeals from decisions of the contracting officer authorized under the contract shall therefore be addressed to the Chief of Engineers, U. S. Army, Washington, D. C. The appeal shall contain all the facts or circumstances upon which the contractor bases his claim for relief and should be presented to the contracting officer for transmittal within the time provided therefor in the contract.

1-33. Electric power to be furnished by the contractor. - The contractor shall make arrangements for, shall pay for, and furnish all necessary power to carry on the work, including sufficient power for lighting and other miscellaneous uses in buildings furnished by the contractor for Government use during the life of the contract. No separate payment will be made to the contractor for the power furnished.

1-34. Rate of wages. - a. In accordance with Article 17 of the contract, the minimum wages shown in the following schedule, as approved by the United States Department of Labor, shall be the minimum rates of wages to be paid by the contractor for work under this contract. Corresponding rates for occupations not listed below will be furnished upon application by the contractor.

<u>Designation</u>	<u>Wage Rate - Hourly</u>
Blacksmiths	\$1.00
Bricklayers	1.375
Carpenters, journeymen	1.25
Cement finishers	1.375
Electricians	1.25
Electricians' apprentices	.75
Firemen, 15 lbs. or over	.80
Firemen, under 15 lbs.	.60
Jackhammermen	.75
Laborers, unskilled	.50
Laborers, building	.75
Mason tenders	.875

<u>Designation</u>	<u>Wage Rate - Hourly</u>
Mechanics, repairmen	\$1.00
Oilers	.65
Painters	1.125
Painters, structural steel	1.50
Plumbers	1.375
Plumbers' helpers	.65
Reinforcing rod setters	1.65
Riggers (derrick)	1.65
Sheet metal workers	1.25
Steamfitters	1.375
Steamfitters' helpers	.65
Structural iron workers	1.65
<u>Operators of power equipment:</u>	
Air compressors	1.30
Concrete mixers, less than 5 bags	.75
Concrete mixers, 5 bags or over	.85
Cranes, derricks, draglines	1.50
Hoists, 1 drum	1.30
Hoists, 2 or more drums	1.65
Piledrivers	1.50
Pumps (mechanical)	.65
Rollers	.90
Shovels, 1/2 yd. or less	1.30
Shovels, over 1/2 yd.	1.50
Tractors, under 50 h.p.	.75
Tractors, 50 h.p. or over, with attachments	1.30
Truck drivers, 2 tons or under	.60
Truck drivers, over 2 tons	.68

b. Any class of laborers and mechanics not listed above, which will be employed on the work, will be classified or reclassified by the contracting officer to conform to the foregoing schedule. In the event of disagreement between the contracting officer and the contractor as to such classification or reclassification, the question, accompanied by the recommendation of the contracting officer, will be referred to the United States Department of Labor for final determination.

c. The above list of wages shall be posted by the contractor in a conspicuous place on the work.

1-35. Reports to Department of Labor. - The contractor shall report and shall cause all subcontractors to report in like manner, within 5 days after the close of each calendar month, on forms to be furnished by the Department of Labor, the number of persons on their respective payrolls, the aggregate amounts of such payrolls, the man-hours worked, and the total expenditures for materials. He shall furnish to the Department of Labor the names and addresses of all subcontractors on the work at the earliest date practicable, provided that the foregoing shall be applicable only to work at the site of the construction project.

1-36. Standard tests, qualities, and guarantees. - a. All materials, supplies, and parts and assemblies thereof, entering into the work to be done under these specifications, shall be tested as specified, or otherwise required, in conformity with the best modern approved methods for the particular type and class of work.

b. Unless waived in writing by the contracting officer, all tests and trials shall be made in the presence of a duly authorized representative of the contracting officer. When the presence of the inspector is so waived, sworn statements, in duplicate, of the tests made and the results thereof, shall be furnished to the contracting officer by the contractor.

c. Costs of all tests and trials, excepting (1) the expense of the Government inspector, (2) cement, concrete aggregate and cylinder tests, and (3) tests on embankment materials, shall be borne by the contractor and shall be included in the contract price. (See Paragraph 1-11.)

d. All materials, parts and equipment shall be of the highest grade, free from defects and imperfections, of recent manufacture, new and unused. Workmanship shall be of the highest grade and in accordance with the best modern standard practice.

1-37. Protection of existing structures. - During construction operations, on work covered by these specifications, the contractor shall protect all existing structures and accepted work. Any disturbances or damage to any structures by operations under these specifications shall be repaired promptly by the contractor without cost to the Government.

1-38. Interference with traffic. - Construction of the work near the New York, New Haven and Hartford Railroad shall be conducted in such a manner that there will be no interference with train service. Construction operations within and adjacent to the right of way area of the Railroad shall be conducted with respect to both time and method as may be required by the Railroad.

1-39. Final acceptance and payment. - As soon as practicable after the completion of the entire work, the contracting officer will make a thorough examination of same and if it is found to comply fully with the requirements of the specifications, it will be accepted, and final payment will be made in accordance with Article 16 of the contract.

1-40. Approval. - This contract shall be subject to the written approval of the Division Engineer, North Atlantic Division, and shall not be binding until so approved.

1-41. Nonrebate. - Affidavit with respect to nonrebate of wages is required of the contractor within 7 days after the regular payment of each and every weekly payroll. (See revised Article 19 of the contract)

SECTION II. EXCAVATION (Items 1 and 2)

2-01. Common excavation - general (Item 1). - a. Work included. - The location and character of the proposed structures are shown on the drawings. It is the intent of the Government that excavation be made to the lines and grades given thereon but the right is reserved to modify any part of the work if, in the opinion of the contracting officer, conditions require such modification (see Articles 3 and 4 of the contract). The contractor shall excavate and dispose of the materials classed as common excavation - general, above and below the mean water level in the river to the lines and grades shown on the drawings for the respective areas, or as otherwise directed by the contracting officer. Excavation shall be performed in accordance with a schedule of operations to be approved by the contracting officer. Common excavation - general includes all excavation for structures, drains, and ditches not included in other items of the work. Excavations shall be made wide enough to permit proper sheeting, bracing, and form work where necessary.

b. Disposal of material. - Material from the excavations shall be used, if possible, in the permanent construction as directed by the contracting officer. No material shall be wasted unless specifically authorized by the contracting officer. If, at the time of excavation, it is not possible to place the material in the proper section of the permanent construction, it shall be stock-piled in approved areas for later use. Materials from the excavation that are unacceptable for use in the permanent construction shall be wasted in spoil areas in approved locations as directed by the contracting officer. After completion of the excavation, spoil areas shall be graded and dressed neatly to the satisfaction of the contracting officer.

c. Shoring. - Where approved by the contracting officer, shoring may be used in lieu of excavation to the slope or pay lines shown on the drawings. The contractor shall be responsible for the unfinished work, and that workmen shall be safe from danger of caving or slides while making structure excavations. Shoring shall be erected in a safe and workmanlike manner, and shall be placed in such a way as to afford ready inspection of and ample clearance for the permanent work. Shoring shall be removed upon completion of the permanent work or as soon as the construction does not require its use. No payment will be made for temporary shoring, but the cost thereof shall be included in the contract price for the excavation. Measurement for payment for excavation will be made to the pay lines specified in Paragraph 3-01 d(3).

d. Sheeting and pumping. - The contractor shall provide all necessary pumps to unwater the site properly and to keep the site free from water during such time as the work is under construction. The contractor shall provide all labor and materials required to keep the site unwatered during the course of construction, and shall provide or construct all necessary sheeting, bulkheads, sumps, drains, ditches, etc., to prevent running water from coming in contact with newly placed concrete or concrete being placed.

e. Measurement. - (1) Excavation will be measured in place and the volume thereof will be computed between the existing ground surface as determined by a survey made just prior to the commencement of the work and the pay lines shown on the drawings. Where pay lines are not shown on the drawings, measurement will be made of the volume between the existing surface as determined from the survey made just prior to the commencement of the work and the lines and grades established by the contracting officer.

(2) Payment for all structure excavations will be made to the pay or slope lines specified above regardless of whether or not it is necessary to remove the material to slopes greater or less than those shown. No payment will be made for excavation outside of the limits described above, and the contractor will be required to backfill any such excess excavation with approved material, or with additional concrete where excess excavations are adjacent to concrete structures, at his own expense.

f. Payment. - (1) The quantity to be paid for under Item 1 will be the number of cubic yards of material excavated, measured as specified in subparagraph e above. Payment will be made at the contract unit price for Item 1, "Common Excavation - General," and shall include the cost of all labor, plant, and incidental costs for excavating, loading, hauling, and disposal of the material, including any stock-piling and rehandling, and the grading and dressing of spoil areas.

(2) Construction roads. - The construction and maintenance of roads and bridges for the contractor's use will not be paid for as such, but the cost thereof shall be included in the contract prices for the other items of work.

2-02. Removal of existing structures (Item 2). - a. Work included. - The contractor shall remove and dispose of the materials in the existing structures as shown on the drawings, and elsewhere as directed by the contracting officer. The concrete fragments shall be broken to sizes suitable for use as dumped rock fill or as required for satisfactory

disposal in spoil areas as directed by the contracting officer. Work shall include the removal of the existing reinforced concrete backwater chamber and cutting existing piling to suitable elevation between Station 51+40± and Station 53+70±.

b. Blasting. - (1) In general, removal of existing structures can be accomplished without blasting. If blasting is found to be necessary, the use of explosives shall be conducted as specified in Paragraph 1-25.

(2) Blasting will be permitted only when proper precautions are taken for the protection of all persons, the work, and property. All damage done to the work or property shall be repaired at the contractor's expense. All operations of the contractor in connection with the transportation, storage, and use of explosives shall be as approved by the contracting officer.

(3) Explosives of such quality and power shall be used in the locations which will, in the opinion of the contracting officer, neither crack nor damage the work outside the lines of excavation. Blasting shall be done only to the lines and grades shown on the drawings or approved by the contracting officer.

(4) Approval by the contracting officer of the method of blasting, or of the strength and amount of the explosive used, will not relieve the contractor of his responsibility in the blasting operations.

c. Disposal of materials. - Excavated materials shall be disposed of in designated spoil areas as provided in Paragraph 2-01 b unless otherwise directed by the contracting officer.

d. Payment. - Payment will be made at the contract unit price for Item 2, "Removal of Existing Structures," which shall include payment for all labor and materials required for the removal and disposal of existing structures.

SECTION III. MISCELLANEOUS BACKFILL AND SEWER DETAILS (Items 3 to 7, incl.)

3-01. General. - "Gravel Bedding," Item 3, includes the gravel, or crushed stone required for dumped rock bedding and bedding for precast concrete sleepers. "Compacted Backfill," Item 4, includes the backfill required for the gate structure and other miscellaneous structures as shown on the drawings. "Dumped Rock Fill," Item 5, is required at the riverside toe of the dike. "Reinforced Concrete Pipe," Item 6, will be required for the Masseeck Street Sewer as shown on the drawings. "Precast Concrete Sleepers," Item 7, are required for support of the reinforced concrete pipe.

3-02. Gravel bedding (Item 3). - a. Gravel bedding of the specified quality required for dumped rock bedding and bedding for the reinforced concrete sleepers shall be placed at the locations shown on the drawings or as directed by the contracting officer.

b. Materials. - Gravel bedding shall consist of suitable clean, durable gravel which shall be approved by the contracting officer and shall conform to the following requirements:

<u>Sieve</u>	<u>Total percent passing</u>
2" square mesh	100%
1/2" square mesh	40% - 95%
4 meshes per inch	5% - 60%
10 meshes per inch	not over 20%

c. Placing. - The material shall be placed as shown on the drawings or as directed, and with such hand placing as may be necessary to trim to the required slopes. The contractor will not be required to tamp or roll the material, but shall consolidate it with water to the extent directed, so that no settlement will later result.

d. Measurement and payment. - The quantity to be paid for under Item 3 will be the number of cubic yards of gravel furnished and placed to the limits, lines, and grades shown on the drawings or ordered. Payment will be made at the contract unit price for Item 3, "Gravel Bedding."

3-03. Compacted backfill (Item 4). - a. Work included. - The contractor shall place, grade, and consolidate materials required for backfill of miscellaneous structures including buried sections of damaged sewer, and elsewhere as directed by the contracting officer.

b. Materials. - Materials shall be obtained from stock piles of excavated materials (see Paragraph 2-01 b), or may be obtained directly from required excavations. Backfill material shall be free from stumps, roots, sod, rubbish, or other unsuitable materials or substances.



c. Placing. - (1) The backfills shall consist of materials suitable for the purpose in the opinion of the contracting officer, and shall be placed in successive layers of not more than 12 inches in depth for the full width of the cross section. Each layer shall be compacted thoroughly with a crawler type tractor weighing not less than 20,000 pounds, except as otherwise approved by the contracting officer. A minimum of four passes of the tractor treads on each square foot of backfill area will be required for satisfactory compaction. Portions of the backfill area which the compacting equipment cannot reach for any reason shall be compacted thoroughly in 4-inch layers by tamping with hand or power tampers. The compaction for such portions of the backfill shall be equivalent to that obtained by compacting with tractor equipment.

(2) Where backfill is to be placed against only one side of a concrete wall or other structure, no backfill material shall be placed until the concrete has been in place at least 10 days and then only by hand or by trucks or bulldozers operating not closer to the wall than the height of the wall above the foundation. No backfill shall be compacted, nor placed by dragline, clamshell, or other equipment which drops the material in relatively large quantities, nor spread by equipment operating closer to the wall than the height of the wall, until the concrete has been in place at least 14 days.

d. Measurement and payment. - Measurement will be made by the cubic yard for the amount of compacted backfill placed in the completed work to the lines and grades shown on the drawings or as directed by the contracting officer. Quantities will be measured in place after compaction. Payment for all work in connection with furnishing and placing compacted backfill will be made at the contract unit price for Item 4, "Compacted Backfill."

3-04. Dumped rock fill (Item 5). - a. Work included. - (1) The contractor shall furnish all equipment and labor required to construct the dumped rock fill at the riverside toe of the earth dike. The rock fill shall be to the limits, lines, and grades shown on the drawings or as directed by the contracting officer, at or below the low water level of the river.

(2) The contractor shall do all the preliminary grading and other incidental work, not included in any other item, required to prepare the site for the dumped rock fill.

b. Material. - (1) Rock fill shall be composed of durable stone or concrete fragments of acceptable sizes. Suitable rock, boulders, and large cobbles from borrow areas or quarries, and stone or concrete fragments from the required excavations (see Paragraph 2-02), shall be used. The rock fill shall consist of fragments of stone or concrete of which none shall be smaller than one cubic foot, except that approximately 10 percent spalls will be permitted for placing adjacent to the bank. Generally the maximum allowable size of single pieces of rock or concrete shall be one-half cubic yard.

c. Placing. - The rock fill shall be constructed of the thickness and to the extent shown on the drawings or directed. The average surface of the rock fill shall satisfactorily approximate the required theoretical. The contractor need not place rock fill by hand, except to rearrange surface stones as necessary to fill unsatisfactory depressions in the surface below the required grade. The rock shall be carefully dumped in place with the larger rocks at the outer faces and the smaller rocks and spalls adjacent to the river bank. A tolerance of one foot above or below the slope line shown on the drawings will be allowed for the finished slope surfaces of the rock fill.

d. Measurement and payment. - The quantity to be paid for under Item 5 will be the number of cubic yards of dumped rock fill satisfactorily placed in the completed work to the specified or ordered lines and grades. The contract unit price shall include payment for furnishing, hauling, and placing the rock. Payment will be made at the contract unit price for Item 5, "Dumped Rock Fill."

3-05. Reinforced concrete pipe (Item 6). - a. Work included. - The contractor shall furnish and install 72-inch reinforced concrete pipe for the Masseek Street Sewer at the locations shown on the drawings and elsewhere as required by the contracting officer.

b. Material. - Reinforced concrete pipe shall be Massey or equal and shall conform to A.S.T.M. Designation C76-40T for "Extra Strength Reinforced Concrete Culvert Pipe."

c. Installation of pipe. - (1) Excavation. - Excavation shall be done as shown on the drawings and as provided for in Paragraph 2-01. Where encountered, rock or boulders shall be removed to a depth sufficient to clear the underside of the pipe and the voids backfilled with well compacted suitable material. Suitable excavations shall be made to fit all junctions or other specials wherever needed. Joints in pipe shall be located as shown on the drawings, with relation to adjacent structures.

(2) Laying pipe. - All pipe shall rest on precast concrete sleepers (see Paragraph 3-06). Proper care shall be used in handling the pipe to avoid injury or breakage. The pipe shall be carefully bedded, and properly connected and jointed. The pipe shall be laid true to the lines and grades shown on the drawings or as staked in the field, with bells upgrade and with spigot ends fully entered in the bells. Joints shall be made with a material similar and equal to "Flashing Cement" as manufactured by Philip Carey Company, Cincinnati, Ohio, and shall be poured in accordance with the manufacturer's instructions except as modified by the contracting officer. The spigots shall be centered in the bells, and there shall be no shoulders or unevenness of any kind along the bottom half of the pipes. Special care shall be taken that the joint space be of equal width around the pipe, making use of jute or oakum gaskets to center the pipe. The interior of the pipe shall be carefully cleaned after laying to remove dirt and other obstructions.

(3) Backfilling. - Backfill material shall be evenly spread and compacted around the pipe. Backfill over the pipe shall be done in accordance with the provisions of Paragraph 3-03 unless otherwise shown on the drawings or as directed by the contracting officer. Hand tamping shall be done as directed.

d. Measurement and payment. - (1) Measurement for payment will be based on the linear feet of pipe installed. Payment will be made at the contract unit price for Item 6, "Reinforced Concrete Pipe," and shall include all costs of furnishing and installing pipe and connections, except the cost of excavation and backfilling.

(2) Payment for excavation will be made at the contract unit price for Item 1 (see Paragraph 2-01). Payment for backfilling will be made at the contract unit price for Item 4 (see Paragraph 3-03).

3-06. Precast concrete sleepers (Item 7). - a. Work included. - The contractor shall furnish all labor, materials, and equipment and do all work required for placing precast concrete sleepers for support of the precast concrete pipe at the locations shown on the drawings or as directed by the contracting officer.

b. Materials. - (1) Precast concrete sleepers shall have the dimensions and reinforcement as shown on the drawings. The concrete shall conform to the requirements of Section IV for Class "A" concrete, except that the cement content of the concrete shall be at least 7 bags per cubic yard. The reinforcing steel shall conform to the provisions of Paragraph 4-18.

(2) All concrete sleepers shall be plainly marked with the casting date, shall be protected against frost and other damage, and shall be cured in conformity with the provisions of Paragraph 4-16. No concrete sleepers shall be removed from their casting position in less than 7 days.

(3) Forms shall be tight and rigid and the sleepers shall be free from injurious cracks or spalls. Sleepers shall be handled carefully, special slings being used if required to avoid dropping or jarring.

c. Measurement and payment. - The quantity to be paid for under Item 7 will be the number of cubic feet of precast concrete sleepers satisfactorily placed as shown on the drawings. Payment will be made at the contract unit price for Item 7, "Precast Concrete Sleepers," and shall include all costs of furnishing and installing the concrete sleepers, including cement, reinforcing steel, and all other materials and equipment incidental thereto.

SECTION IV.. CONCRETE (Items 8 to 10, incl.).

COMPOSITION, CLASSIFICATION AND STRENGTH

4-01. Composition. - Concrete shall be composed of cement, fine aggregate, coarse aggregate, and water so proportioned and mixed as to produce a plastic, workable mixture in accordance with all requirements under this section, and suitable to the specific conditions of placement.

4-02. Classification. - Except where required to meet special conditions all concrete shall be Class "A" as designated in Paragraph 4-22 and on the drawings for the various parts of the work in accordance with the conditions of application and the proportions of materials and strengths required.

4-03. Strength. - The mixes will be designed to secure concrete having at least the following compressive strengths at the age of 28 days, as determined by breaking standard 6-inch diameter by 12-inch height test specimens:

<u>Class</u>	<u>Average for any 25 consecutive cylinders</u>	<u>Minimum for any one cylinder</u>
A	3400 lbs. per sq. in.	2600 lbs. per sq. in.

4-04. High-early-strength concrete. - High-early-strength concrete made with high-early-strength Portland cement or other special cements shall be used only when specifically authorized by the contracting officer. The 7-day compressive strength of concrete of any class, when made with high-early-strength cement, shall be at least equal to the specified minimum 28-day compressive strength for that class. All provisions of these specifications, except for cement, shall be applicable to such concrete. Any high-early-strength cement used shall be approved by the contracting officer before use.

MATERIALS

4-05. Portland cement (Item 8). - a. The contractor shall furnish Portland cement of the quality herein specified in sufficient quantity for the work required. Cement for all concrete, grout, and mortar, except as specified in subparagraph b, shall conform to Federal Specification SS-C-206a, for "Cement, Portland, Moderate-Heat-of-Hardening", except that Paragraph E-7, Heat of Hydration, shall be considered inoperative.

b. High-early-strength Portland cement. - Cement for high-early-strength concrete shall be in accordance with Federal Specification SS-C-201 for "Cement, Portland, High-Early-Strength."

c. Special test requirements. - Cement will be tested by the Government at the Central Concrete Laboratory, West Point, N. Y. No cement shall be used until notice has been given by the contracting officer that the test results are satisfactory. Cement which has been stored, other

than in bins at the mills, for more than 4 months after being tested shall be retested before use. Ordinarily, no cement shall be used until after it has satisfactorily passed both the 7- and 28-day tests, but in cases of emergency the contracting officer may waive the 7- and the 28-day tests and permit the use of satisfactory cement upon completion of the chemical analysis and the 3-day compressive strength test; provided it is the product of a quarry and mill having established a reputation of not less than 3 years' standing for the production of high-grade cement. If the tests prove any cement unsatisfactory, which has been delivered at the site of the work, such cement shall be removed promptly from the work and its vicinity.

d. Identification. - Cement shipped in bags shall be identified by the manufacturer by marking or tagging the bags with identifying number or symbol of the Federal Specification under which it was manufactured. Bulk shipments of cement shall be likewise identified by a suitable device affixed to each car or other type of bulk carrier. Marking or tagging shall be done at the mill.

e. Quality and packages. - All cement shall be dry, finely ground and free from lumps or caking. Unless otherwise permitted, the cement shall be delivered in canvas bags or other strong, well-made packages, each plainly marked with the manufacturer's brand. The weights of such bags shall be uniform. Packages received in broken or damaged condition will be rejected or accepted only as fractional packages. Cement shall be stored in a satisfactory manner so as to be unaffected by moisture, keeping each carload separate until the results of the 28-day tests are known. Suitable accurate scales shall be provided by the contractor for weighing bulk cement.

f. Records of cement used. - The contractor shall furnish to the contracting officer, at the end of each day's work, a statement showing, in such detail as he may reasonably require, the quantity of cement used during the day at each part of the work.

4-06. Fine aggregate. - a. Composition. - Fine aggregate shall be natural sand.

b. Quality. - Fine aggregate shall consist of hard, strong, durable and uncoated particles.

c. Grading. - (1) Except as provided in (2) below, fine aggregate shall conform to the following requirements:

Total passing	Per cent by weight
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No. 4 sieve	95 - 100
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No. 16 sieve	45 - 75
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No. 50 sieve	10 - 25
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No. 100 sieve	1.5 to 7
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(2) Deficiencies in the percentage of fine aggregate passing #50 and #100 sieves, as required in the above gradation, may be remedied by the addition of pozzuolanic or cementitious materials, excepting Portland cement; provided, at least 5 percent passes the #50 sieve and the aggregate is of proper consistent gradation within the specified limits. Such added material, which will be considered and included as fine aggregate, shall conform to the requirements in Paragraph 4-08 and shall be in sufficient quantity to meet the minimum requirements above for percentage passing #100 sieve and otherwise to produce the workability required by the contracting officer. The quantity and characteristics of any material used for the purpose of correcting workability shall be such that when the concrete is gaged to the proper consistency, the total water content shall not exceed by more than one gallon per cubic yard the minimum quantity required for proper consistency when not using the admixture. The blending of any material with the original naturally graded sand to remedy deficiency in gradation shall be accomplished in charging the mixer, unless otherwise specifically authorized by the contracting officer.

d. Deleterious substances. - The substances designated shall not be present in excess of the following amounts:

	Per cent by weight
Clay lumps	1
Material removed by decantation from aggregates	3
Shale	0.5

e. Mortar strength. - Mortar specimens made with the fine aggregates shall have a compressive strength at 28 days of at least 90 percent of the strength of similar specimens made with Ottawa sand having a fineness modulus of  $2.40 \pm 0.10$ .

f. Tests. - Fine aggregate shall be subject to careful, thorough analyses, including magnesium sulphate soundness tests (see Paragraph 4-07 d), to determine conformity with all requirements of these specifications.

4-07. Coarse aggregate. - a. Composition. - Coarse aggregate shall be washed gravel, crushed stone or any approved mixture of washed gravel and crushed stone.

b. Quality. - Coarse aggregate shall consist of hard, tough and durable particles free from adherent coating. It shall contain no vegetable matter, nor soft, friable, thin or elongated particles in quantities considered deleterious by the contracting officer. The substances designated shall not be present in excess of the following amounts (by weight):

Soft fragments	5%
Clay lumps	1 1/2%
Removed by decantation	1%

When the material removed by decantation consists essentially of crusher dirt, the maximum amount permitted may be raised to 1 1/2 percent. When crushed stone is used, the crusher shall be equipped with a screening system which will entirely separate the dust from the stone and convey it to a separate bin. Aggregate which has disintegrated or weathered badly under exposure conditions similar to those which will be encountered by the work under consideration shall not be used.

c. Size. - (1) Coarse aggregate shall be well graded from fine to coarse so that concrete of the required workability, density, and strength can be made without the use of an excess amount of sand, water, or cement.

For Class "A" concrete the maximum size mesh screen for the aggregate shall be 1 inch.

(2) The grading of the coarse aggregate, in the mixed concrete, shall fall within the following limits:

<u>Passing</u>	<u>Per cent by weight</u>
Maximum size mesh screen (square mesh)	97 - 100
1/2 maximum size mesh screen (square mesh)	40 - 70
No. 4 sieve	0 - 6

d. Tests. - Coarse aggregate will be subjected to freezing and thawing tests and to careful, thorough analyses to determine conformity with all requirements of these specifications. Coarse aggregate will be subjected to 10 cycles of the magnesium sulphate test for soundness (A.S.T.M. C88-41T). No aggregate shall be used which develops a loss in excess of 10 percent by weight.

4-08. Material added for workability. - a. The use of any material added to the mix to improve workability (see Paragraph 4-06c(2)), which, in the opinion of the contracting officer, may have an injurious effect on the strength, density, and durability of the concrete, will not be permitted. Before approval of any material, the contractor will be required to submit the results of complete chemical and sieve analyses made by an acceptable testing laboratory. Subsequent tests will be made of samples taken by the contracting officer from the supply of the material being used on the work to determine whether it is uniform in quality with that approved.

b. The material added shall be pozzuolanic, cementitious or silicious. It shall not contain effective early-heat-producing elements or compounds, such as those contained in Portland cement, nor shall its

use result in a material increase in the free-lime content of the concrete. It shall also be in conformity with the following requirements:

Free moisture - a total of not more than 3 percent by weight.

Passing #30 sieve - not less than 100 percent by weight.

Passing #200 sieve - not less than 85 percent by weight.

4-09. Water. - The water used in mixing concrete shall be fresh, clean and free from injurious amounts of oil, acid, alkali, or organic matter.

4-10. Storage. - a. Cement. - Immediately upon receipt, at the site of the work, cement shall be stored in a thoroughly dry, weathertight, and properly ventilated building with adequate provisions for the prevention of the absorption of moisture. The building shall be of adequate capacity to provide for the requirements of delivery and construction schedules. Storage shall be such as to permit easy access for inspection and definite identification of each shipment.

b. Aggregates. - The fine and coarse aggregates shall be stored separately (see Paragraph 7-07c(2)) and in such manner as to avoid the inclusion of any foreign material in the concrete. Stockpiles of coarse aggregates shall be built in horizontal layers to avoid segregation.

4-11. Sampling and testing aggregates. - Except where provided otherwise by these specifications, all sampling and testing of aggregates shall be made in accordance with the Federal Specifications. Unless specified otherwise, all test samples shall be taken under the supervision of the contracting officer and supplied to the Central Concrete Laboratory, West Point, N. Y., by the contractor at his expense. The source from which concrete aggregates are to be obtained shall be selected by the contractor well in advance of the time when they will be required in the work, and suitable samples as they are to be used in the concrete shall be furnished to the contracting officer at least 40 days in advance of the time when the placing of the concrete is expected to begin. The contractor shall obtain fine and coarse aggregates for any concrete from approved sources.

#### PROPORTIONING, MIXING AND PLACING

4-12. Proportioning. - a. Basis. - All concrete materials will be proportioned so as to produce a workable mixture in which the water content will not exceed the maximum specified.

b. Control. - The exact proportions of all materials entering into the concrete shall be as directed by the contracting officer. The contractor shall provide all equipment necessary to positively determine and control the actual amounts of all materials entering into the concrete. The proportions will be changed whenever, in the opinion of the contracting officer, such change becomes necessary to obtain the specified strength and the desired density, uniformity and workability, and the contractor will not be compensated because of such changes.



c. Measurement. - All materials shall be measured by weight except that water may be measured by volume when so authorized by the contracting officer. One bag of cement will be considered as 94 pounds in weight and 1 gallon of water as 8.33 pounds.

d. Cement content. - Each cubic yard of concrete shall contain not less than the quantity of cement stated below:

Class "A" - 5.0 bags or 470 pounds

For concrete deposited in water, the minimum cement content shall be 6.5 bags or 611 pounds to each cubic yard of concrete in place.

e. Water content. - (1) In calculating the total water content in any mix the amount of moisture carried on the surface of the aggregate particles shall be included. The total water content for a bag of cement for each batch of concrete shall not exceed the following:

Class "A" - 5.5 gallons or 45.8 pounds

In all cases, however, the amount of water to be used shall be the minimum amount necessary to produce a plastic mixture of the strength specified and of the desired density, uniformity and workability. In general, the consistency of any mix shall be that required for the specific placing conditions and methods of placement, and ordinarily the slump shall be between 1 inch and 3 inches when tested in accordance with the current specifications for "Method of Test for Consistency of Portland Cement Concrete," of the American Society for Testing Materials.

(2) An increase in the maximum water content, based only on the requirements of materials added in accordance with Paragraph 4-06c(2) to improve workability, will not be permitted unless comparative tests under job conditions show conclusively that such increase in water content will not result in a decrease in concrete strength and provided further that such increase does not exceed 1 gallon per cubic yard.

f. Aggregate content. - The total volume of aggregate to be used in each cubic yard of concrete shall be that necessary to produce a dense mixture of the required workability as determined by the contracting officer.

4-13. Mixing and placing. - a. Equipment. - The contractor shall provide at the site of the work a modern and dependable batch type mixing plant with a minimum capacity of 50 cubic yards of concrete per 8 hours or, if approved by the contracting officer, the contractor may use ready-mixed concrete delivered in standard truck mixing equipment of approved capacity. The equipment shall provide adequate facilities for the accurate measurement and control of all materials and for readily changing the proportion of materials to conform to the varying conditions of the work in order to produce concrete of the required uniform strength and durability.

b. Time. - The minimum time for mixing each batch, after all materials are in the mixer, shall be as follows:

1/2 to 1-1/2 cu. yd. mixer 1-1/2 minutes  
Larger than 1-1/2 cu. yd. mixer 2 minutes

The mixer shall revolve a minimum of 12 revolutions after all materials have been placed in it, and at a uniform speed. Neither speed nor volume capacity of the mixer shall exceed those recommended by the manufacturer. Excessive overmixing, requiring additions of water to preserve the required consistency, will not be permitted.

c. Conveying. - Concrete shall be conveyed from mixer to forms as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. It shall be deposited as nearly as practicable in its final position. Conveying of concrete by means of chutes will not be permitted except for short chutes in the forms to distribute the concrete. Chutes used shall be such that the concrete slides in them and does not flow. Chutes with a flatter slope than 1 on 2 will not be permitted. There shall be no free vertical drop greater than 5 feet except where specifically authorized by the contracting officer.

d. Placing. - (1) Concrete shall be placed before initial set has occurred, and in no event after it has contained its water content for more than 45 minutes.

(2) Unless otherwise specified, all concrete shall be placed in the dry upon clean, damp surfaces, free from ice, frost or running water, and never upon soft mud, dry porous earth, or upon fills that have not been subjected to approved rolling, puddling or tamping so that ultimate settlement has occurred.

(3) All monoliths shall be of the dimensions shown on the drawings.

(4) All concrete shall be deposited in approximately horizontal layers not to exceed 24 inches in thickness, unless otherwise specifically authorized or directed by the contracting officer and the concreting shall be carried on as a continuous operation, as far as practicable, until the placing in the course, section, panel or monolith is completed. Unless otherwise shown on the drawings, courses shall generally have a minimum thickness of 4 feet, and a maximum of 18 feet, except that in hot weather the contracting officer may direct the maximum be reduced to 8 feet. A minimum time interval of 48 hours shall be allowed between successive courses for the dissipation of heat of hydration.

(5) In dropping concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. On flat surfaces, where the congestion of steel near the forms makes placing difficult, a mortar of the same cement-sand ratio as is used in the concrete shall be first deposited to cover the forms.

(6) All top surfaces not covered by forms and which are not to be covered by additional concrete or backfill shall be carried slightly above grade and struck off by board screed (see Paragraph 4-15), except that top surfaces of walls and piers not covered by forms and which are not to be covered by additional concrete or backfill, when poured in excess of 10 feet in height in one pour, shall be carried not less than 2 inches above the specified finished elevation and struck off by board screed.

e. Vibrating. - Concrete shall be placed with the aid of mechanical vibrating equipment as approved by the contracting officer. Vibration shall be transmitted directly to the concrete unless otherwise directed by the contracting officer. The frequency of vibration shall be not less than 5000 per minute. The intensity of vibration shall be sufficient to cause flow or settlement of the concrete into place. The vibration shall be of sufficient duration to accomplish thorough compaction as approved by the contracting officer. External vibration may be used for thin sections where internal vibration would be impracticable. Vibration shall be supplemented by forking or spading by hand, adjacent to the forms on exposed faces in order to secure smooth, dense, even surfaces. The concrete shall be compacted and worked in an approved manner into all corners and angles of the forms and around reinforcement and embedded fixtures.

f. Construction joints. - Vertical joints shall be formed with tongue-and-groove bonds or keys at such locations and of such shapes and dimensions as approved or directed by the contracting officer. Horizontal joints shall be formed with roughened level joints or with keys, or, where horizontal pressure is always in one direction, with steps as approved or directed by the contracting officer. Where required, dowel rods shall be used. All concrete in vertical members shall have been in place not less than 12 hours, and longer if so directed by the contracting officer, before concrete in horizontal members resting thereon is placed. As soon as practicable after placing and immediately before placing the succeeding layers is resumed, all approximately horizontal surfaces shall be washed with a high pressure air-and-water jet, or cleaned as otherwise directed by the contracting officer. Sand shall be added to the air-and-water jet when required to remove alkali, algae, stains, and other substances injurious to the bond. The time and method of using the jet shall be such that all laitance, scum, etc., will be removed so the partly embedded aggregate is not disturbed and is washed clean. After final cleaning and immediately before placing is resumed, the surfaces shall be wetted and spread with a layer of mortar 1/2 inch thick, thoroughly brushed in. The mortar shall be the same cement-sand ratio as the concrete. Where specified or otherwise required by the contracting officer for watertight construction, copper strips not less than 12 inches in width and weighing not less than 20 ounces per square foot, properly crimped or bent, shall be placed in the concrete to span the joint.

g. Cold weather. - Concrete shall not be placed when the ambient atmospheric temperature is below 35 degrees F., nor when the concrete is likely to be subject to freezing temperatures before final set has occurred, unless specifically authorized by the contracting officer in writing. When so authorized, the materials shall be heated in order that the temperature of the concrete, when deposited, shall be not less than 50 degrees F. nor more than 70 degrees F. All methods and equipment for heating shall be subject to the approval of the contracting officer.

h. Hot weather. - For the concrete placed during the extremely warm summer months, and otherwise when directed by the contracting officer, the aggregates shall be cooled by frequent spraying in such manner as to utilize the cooling effect of evaporation. During such periods the placement schedule shall be arranged as approved by the contracting officer in such manner as to provide time for the temperature of the previously placed course to begin to recede. The mixing water shall be the coolest available at the site in so far as is practicable.

4-14. Test specimens. - a. Number. - Test specimens, to determine whether the compressive strength of the concrete is in accordance with that specified in Paragraph 4-03, will be taken by the inspector. At least 1 set of 3 specimens will be made for every major pour and in general for every 150 cubic yards of concrete placed, but in any event, a sufficient number of specimens will be taken to give a comprehensive knowledge of the concrete placed during each day in each section of the work.

b. Method. - All specimens will be taken from the concrete at the mixing plant. The specimens will be tested by the Government at the Central Concrete Laboratory, West Point, N. Y. All costs of transportation and testing of specimens will be borne by the Government.

4-15. Finishing. - Immediately after placement, the concrete shall be properly forked back along the face of all forms by the use of standard concrete forks or spades unless otherwise specifically authorized or directed by the contracting officer. The finished surfaces shall be free from sand streaks or other voids and the plastering over of such surfaces will not be permitted. Defective concrete shall be repaired by cutting out the unsatisfactory material, and placing new concrete which shall be formed with keys, dovetails or anchors to attach it securely to the other work. This concrete shall be drier than the usual mixture and shall be thoroughly tamped into place. All surfaces of concrete not covered by forms, that are not to be covered by additional concrete, or backfill, shall have a wood float finish without addition of mortar, and shall be true to elevations as shown on the drawings. Care shall be taken to see that all excess water is removed before making this finish. Other surfaces shall be brought to the specified finished elevation and left true and regular as approved by the contracting officer. Where considered necessary by the contracting officer, or where indicated on the drawings, joints shall be carefully made with a jointing tool. Every precaution shall be taken by the contractor to protect finished surfaces from stains or abrasions. No fire shall be permitted in direct contact with any concrete at any time. Concrete surfaces or edges likely to be injured during the construction

period shall be properly protected by leaving the forms in place, or by erecting covers satisfactory to the contracting officer.

4-16. Curing. - a. Warm weather. - All concrete shall be adequately protected from injurious action by the sun. Fresh concrete shall be protected from heavy rains, flowing water, and mechanical injury. All concrete shall be kept wet for a period of not less than 14 days by covering with water, or with an approved water-saturated covering, or by a system of perforated pipes or mechanical sprinklers, or any other approved method which will keep all surfaces continuously (not periodically) wet. Where wood forms are left in place for curing, they shall be kept wet at all times to prevent opening at the joints and drying out of the concrete. Water for curing shall be generally clean and entirely free from any elements which in the opinion of the contracting officer might cause staining or discoloration of the concrete.

b. Cold weather. - Concrete when placed during cold weather shall be kept moist and provided with adequate protection for a period of not less than 14 days, subject to the approval of the contracting officer, so that the air in contact with the concrete will be maintained at temperatures between 50 degrees F. and 70 degrees F. for at least the first 5 days of the curing period. For massive sections, where the atmospheric temperatures are sufficiently low in the opinion of the contracting officer to cause excessively rapid cooling and contraction of the exterior surfaces, this period for maintaining the temperature of the air in contact with the concrete between 50 and 70 degrees F. shall extend over the entire curing period. Salt or other chemicals shall not be admitted into the mixture to prevent freezing.

#### FORMS, REINFORCEMENT AND PAYMENT

4-17. Forms. - a. Materials. - Forms shall be of wood, steel or other approved material, except that where lining is not specified, the sheeting for all exposed surfaces shall be tongue-and-groove lumber of uniform width unless otherwise specifically authorized. Forms of like character shall be used for similarly exposed surfaces in order to produce a uniform appearance. The type, size, shape, quality and strength of all materials of which the forms are made shall be subject to the approval of the contracting officer.

b. Construction. - Forms shall be built true to line and grade, and shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports. Responsibility for their adequacy shall rest with the contractor. Their surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. Bolts and rods used for internal ties shall be so arranged that, when the forms are removed, all metal will be not less than 2 inches from any concrete surface. Wire ties will not be permitted where the concrete surface will be exposed to weathering and discoloration will be objectionable. All forms shall be so constructed that they can be removed

without hammering or prying against the concrete. Unless otherwise indicated, suitable moldings shall be placed to bevel or round exposed edges, at expansion joints or any other joints as may be required by the contracting officer.

c. Coating. - Prior to the placing of steel reinforcement or concrete, forms for exposed surfaces shall be coated with a non-staining mineral oil. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling, immediately before the placing of concrete, except that in freezing weather oil shall be used.

d. Removal. - Forms shall not be removed without the approval of the contracting officer, and all removal shall be accomplished in such manner as will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum number of days indicated below, except when specifically authorized by the contracting officer. When, in the opinion of the contracting officer, conditions on the work are such as to justify it, forms may be required to remain in place for longer periods.

Arches, beams and slabs	7 days
Columns	3 days
Walls and vertical faces	2 days

4-18. Furnishing, bending and placing steel reinforcement (Item 10). -

a. Work included. - The contractor shall furnish, cut, bend and build into the concrete in accordance with the drawings, all steel reinforcement of deformed bars, dowels or anchors, or any other plain steel for similar purposes. Materials shall be as specified in Paragraph 5-02 a(1). Steel reinforcement may be cut and bent at the mill or in the field. All bending shall be in accordance with standard approved practice and by approved machine methods.

b. Placing. - (1) All steel reinforcement shall be placed in the exact positions and with the spacing shown on the drawings or ordered, and it shall be so fastened in position as to prevent its becoming displaced during the placing of the concrete. The clear distance between parallel rods shall be not less than one and one-half times the diameter of round rods, or twice the side dimensions of square rods, and unless specifically authorized, shall in no case be less than 1 inch.

(2) Except where otherwise indicated, steel reinforcement shall be placed as follows:

(a) All main reinforcement shall be placed not less than 3 inches from any surface, except in slabs and in buildings.

(b) All main reinforcement in walls and slabs exposed to the weather, and in fire-resistant construction, shall be placed not less than 1-1/2 inches from the surface in walls and slabs, 2 inches in floor beams and 2 inches in girders and columns. The covering of stirrups, spacer rods, and similar secondary reinforcement may be reduced by the diameter of such rods. The above dimensions shall be measured from the face of the reinforcement to the face of the forms.

(c) Where splices in reinforcement, in addition to those indicated, are necessary, there shall be sufficient lap to transfer the stress by bond as may be directed. Rods shall be lapped not less than 40 diameters and splices shall be staggered. The lapped ends of rods shall be separated sufficiently or connected properly to develop the full strength of rod.

c. Protection. - Steel reinforcement shall be new unrusted stock, free from loose scale. It shall be at all times satisfactorily protected from moisture until placed in final position. Ends of rods that are to be left projecting for a considerable time shall be protected from corrosion by heavy wrappings of burlap saturated with bituminous material.

4-19. Embedded items. - In addition to steel reinforcement, there shall be built into, or set, or attached to the concrete, pipes, and man-hole frames and covers, and other metal objects as shown on the drawings or ordered. All necessary precautions shall be taken to prevent these objects from being displaced, broken or deformed. Before placing concrete, care shall be taken to determine that any embedded or wood parts are firmly and securely fastened in place as indicated. They shall be thoroughly clean and free from paint or other coating, rust, scale, oil, or any foreign matter. The embedding of wood in concrete shall be avoided whenever possible, metal being used instead. The concrete shall be packed tightly around pipes and other metal work so as to prevent leakage and secure perfect adhesion. Drains shall be adequately protected from intrusion of concrete into them. Payment for this work is included in the several items for drains and metal work.

4-20. Expansion and contraction joints. - Expansion and contraction joints shall be constructed at such points and of such dimensions as may be indicated or required. The method and materials used shall be subject to the approval of the contracting officer and the materials shall conform to Federal Specifications wherever applicable. Unless otherwise indicated on the drawings, or required by the contracting officer, expansion joints shall be made by coating concrete surfaces with a coat of bituminous cement as specified in subparagraph b below, and then applying premoulded sponge rubber or compressed cork filler 1/2 inch thick which shall then be similarly coated. The 1/2-inch rubber or cork filler shall be used for the 2 feet adjacent to top surfaces and 1 foot adjacent to vertical surfaces. In no case shall corner protection angles, or other fixed metal

embedded in the surface of the concrete and bonded, be continuous through an expansion joint. Payment for all expansion joint material shall be included in the contract unit price for concrete.

b. Bituminous cement shall be an internal set-up cement of asphaltic base, composed of a liquid asphaltic fluxing agent with an admixture of powdered asphalt, asbestos fiber and other suitable inorganic fillers. When mixed in the proper proportions, the cement shall be suitable for proper trowel application and shall harden to a consistency as specified in subparagraph (3) below:

(1) The material shall be supplied in containers of proper relative size to apportion batches with the desired troweling consistency. The liquid asphaltic fluxing agent shall be a smooth uniform mixture, not thickened or jelled, and showing no separation which cannot be easily overcome by stirring. The powdered cement shall be a uniform mix containing no matted lumps of fiber.

(2) When mixed in the proportions recommended by the manufacturer, the cement shall yield not less than 85% of non-volatile matter when 10 grams are heated in an oven at 105 to 110 degrees Centigrade for 24 hours.

(3) When tested in accordance with A.S.T.M. Specification D5-25 for "Penetration of Bituminous Materials" the above mixture shall have the following characteristics: Immediately after mixing, using a 5/8-inch diameter steel ball, 1114 grams, 5 seconds, the mixture shall permit a penetration greater than 300. The same specimen, after a lapse of 24 hours at 25 degrees Centigrade under water, shall permit a needle penetration 100 grams, 5 seconds, of not more than 100. The same specimen, after a lapse of 30 days at 25 degrees Centigrade under water, shall permit a needle penetration 100 grams, 5 seconds, of not more than 50.

4-21. Measurement and payment. - a. Portland cement (Item 5). - (1) The quantity to be paid for under Item 5 will be the number of barrels of cement used in all parts of the work unless specifically excepted. For purposes of payment, a barrel of cement shall be considered 376 pounds net of cement. The contract unit price for the cement shall include payment for all expenses incidental to delivering the cement upon the work in which it is to be used.

(2) Only the cement furnished for concrete work to be done under Item 9 (see Paragraph 1-05) will be paid for at the contract unit price for Item 5, "Cement." Cement used for mortar and grout in pipe joints, and under other items, will be included in the payment for those items.

b. Concrete (Item 9). - See Paragraph 4-22 b.

c. Steel reinforcement (Item 10). - The quantity to be paid for under Item 23 will be the number of pounds of steel placed in accordance



with the drawings or as directed by the contracting officer, measured as specified. It will not include any waste material due to the fact that the lengths supplied are too long for their purpose. The quantity to be paid for will, however, include extra metal in laps, where authorized, due to the fact that single bars would be unreasonably long. In computing the weights, the theoretical weight of plain bars will be used as tabulated in Federal Specification QQ-B-71a for the lengths placed as required. Wire or metal clips, and other supports necessary to hold the steel in place, will not be considered as reinforcement but shall be furnished by the contractor without additional compensation. The contract unit price for Item 1, "Steel Reinforcement," shall include furnishing, bending, cutting, placing, fastening in position, coating and protecting the reinforcement, and all other work and materials connected therewith. (See Paragraph 4-18 a.)

4-22. Concrete structures. - a. Work included. - (1) Concrete structures shall be constructed as shown on the drawings and in accordance with modifications designated by the contracting officer. Concrete shall conform to all the requirements as specified herein for concrete of the class specified. Surfaces of concrete shall be finished as specified in Paragraph 4-15, except as otherwise indicated on the drawings. In all concrete walls, vertical construction joints shall be provided for and spaced not to exceed 30 feet apart.

(2) Concrete - Class A (Item 9) includes the concrete for the gate structure and miscellaneous structures placed between the limiting lines and grades as shown on the drawings or directed by the contracting officer. Forms shall be constructed in accordance with the provisions of Paragraph 4-17. Concrete fins formed on exposed surfaces shall be removed after the forms are stripped. Pipe drains and miscellaneous metal work shall be installed as provided for on the drawings. Any grouting of metal work shall be included as part of the concrete.

b. Measurement and payment. - The quantity to be paid for under Item 9 will be the number of cubic yards of concrete satisfactorily placed between the limiting lines and grades as shown on the drawings or directed by the contracting officer. No deductions shall be made for openings having a cross-sectional area less than that of a 12-inch pipe, nor for the space occupied by reinforcing steel, miscellaneous metal, wood nailing strips, or by other materials required to be built into the concrete. The contract unit price shall include payment for all costs of furnishing materials, erecting and removing forms, mixing and placing concrete and furnishing and installing expansion joint material, except that cement, reinforcing steel and other metal work are included under other items. (See Paragraph 4-21.) Payment will be made at the contract unit price for Item 9, "Concrete - Class 'A'."

SECTION V. VALVES, METALS, AND EMBEDDED ITEMS (Items 11 to 13; incl.)

5-01. General. - a. All metals, unless otherwise specified, shall conform to applicable Federal Specifications, and, when not covered thereby, to applicable A.S.T.M. Specifications. All castings shall have the pattern or mark number cast on them. Unless otherwise authorized by the contracting officer, the scale weights of each casting or forging after machining shall be within 5 percent of the weights as calculated from the dimensions specified or shown on the drawings. Castings shall conform, at the minimum section thereof, to the following dimensional tolerances: where embedded in concrete, to within 1/8 inch; where not embedded in concrete, to within 1/16 inch of the dimensions shown on the drawings.

b. The various articles shall be furnished and placed as indicated on the drawings, unless otherwise directed by the contracting officer. The more important articles required are listed below and are required at the gate structure, or elsewhere; but other articles, whether or not shown on the drawings, becoming necessary in the development of detailed plans and satisfactory construction shall also be furnished.

5-02. Materials and workmanship. - a. The articles included in Items 11 to 13, inclusive, other miscellaneous materials, and all metals required in the work, except as otherwise specified, shall meet the requirements of the following specifications where applicable to the use intended:

(1) Steel reinforcement shall be of new billet intermediate grade, open-hearth steel, deformed, and shall conform to Federal Specification QQ-B-71a for "Bars, reinforcement, concrete, Type 'B', Grade 2" (dated January 12, 1938). Certified copies of any mill test required shall be furnished by the contractor and the steel shall be subjected to such tests as the contracting officer may consider necessary to establish its quality, including particularly the requirements of bending and elongation. The steel shall be free from oil, paint, dirt, or excessive rust.

(2) Structural steel, - Federal Specification QQ-S-711a; shapes, plates, bars, pins, and bolts shall be Class "A", and rivets shall be Class "C", unless otherwise required. Welding will be accepted only where specified or authorized, and approved only when done in accordance with the current requirements of the American Welding Society.

(3) Iron castings, gray, - Federal Specification QQ-I-652, class as indicated. Tensile tests and chemical analysis will not be required.

(4) Malleable iron castings, - Federal Specification QQ-I-666, Type "A".

(5) Bolts, screws, and washers, - Federal Specification FF-B-751a and current standard practice, unless otherwise specified.

(6) Wrought iron bars and shapes. - Federal Specification QQ-I-686, Grade "B".

(7) Sheet copper. - Federal Specification QQ-C-501, Type V, Class "A".

b. Other items, unless otherwise specified, shall conform to current standard practice for the material required and use intended.

5-03. Galvanizing and painting. - a. Galvanized iron or steel articles, as indicated on the drawings, shall be galvanized by the hot-dip process unless otherwise directed. Injuries to the galvanizing shall be satisfactorily repaired. Provision shall be made for protecting threads either by counter-boring fittings, so as to cover threads, or by cutting threads so as to make a very loose fit before galvanizing and carefully rerunning threads after galvanizing so as to leave a good coating all over threads. Hot galvanizing shall be of such quality as to endure at least 4 one-minute immersions in copper sulphate solution, in accordance with the requirements of the Preece test.

b. All ungalvanized iron and steel to be exposed in the finished work shall be thoroughly cleaned and then thoroughly and evenly painted with one coat of red lead paint and two coats of an approved lead-and-oil paint to the satisfaction of the contracting officer. No painting shall be done until the condition of the surface to be painted has been approved. The paint shall be applied by either brush or spray in a neat, thorough, and workmanlike manner, and in no event shall any paint be applied in freezing, rainy, or misty weather. The paint used shall conform to the requirements of Federal Specifications of Group "TT"; and samples of paint shall be submitted to the contracting officer for approval and selection. (See Paragraph 6-10.)

5-04. Flap valves (Item 11). - a. Work included. - The contractor shall furnish and install two 12-inch flap valves each attached to a length of 12-inch cast iron pipe as shown on the drawings or as directed by the contracting officer.

b. Materials. - (1) The flap valves shall be Chapman Table 25 or equal with flange connections and shall conform to the requirements of current American Water Works Association specifications applicable to the size and use intended.

(2) Cast iron pipe shall meet the requirements of current American Water Works Association specifications for standard weight pipe, Class A, where applicable, shall be asphalt-coated inside and outside, and shall have flanged connections as shown on the drawings or as directed by the contracting officer.

c. Payment. - Payment will be made on the basis of the flap valve units complete with attached cast iron pipe and 27-inch reinforced concrete pipe, together with necessary grouting, under Item 11, "Flap Valves - 12-inch," and shall include all costs of furnishing and installing the valves.

5-05. Miscellaneous iron and steel, - (Item 12). - a. Manhole steps, guard angles, and other miscellaneous iron and steel items required at the gate structure and elsewhere shall be furnished and installed as shown on the drawings. The contractor shall submit to the contracting officer for approval, in accordance with Paragraph 1-04 c, complete shop details of all miscellaneous iron and steel which he proposes to install.

b. Payment will be made as specified in Paragraph 5-07.

5-06. Copper water stops (Item 13). - a. Copper water stops required for the construction joints and expansion joints of concrete work shall be furnished and installed. Copper water stops used in concrete expansion and construction joints shall be continuous, and shall be crimped for expansion joints only. Splicing of the water stops shall be done by overlapping, riveting and soldering, or brazing. Unless otherwise specified on the drawings, the material shall be 20-ounce sheet copper of approved standard. At expansion joints the crimp shall be filled with a mastic filler of "elastite" or equal as manufactured by Philip Carey Company, Cincinnati, Ohio. Copper water stops shall be placed in the expansion joints indicated on the drawings.

b. Payment will be made as specified in Paragraph 5-07.

5-07. Measurement and payment. - a. The quantities to be paid for under Items 12 and 13 will be the number of pounds respectively furnished and installed in accordance with the drawings and specifications. Where practicable, the quantities shall be determined by weighing the articles and materials. When weighing is not practicable, the actual weight of each part or item involved will be determined by the contracting officer, who will use for that purpose manufacturers' weights, catalog weights, and computed weights. The weight of all tare, packing, and blocking will be deducted, so that only net weights are used for payment quantities; provided, that no payment will be made for any weight in excess of 5 percent more than the computed weight as determined from the drawings.

b. In calculating computed weights, the following unit weights of the several materials will be used unless otherwise specified:

Structural steel	- 0.2833 pound per cubic inch.
Cast iron	- 0.2604 pound per cubic inch.
Copper water stops	- 20 ounces per square foot.

c. Payment will be made at the applicable contract unit prices for Items 12 and 13 (see Paragraph 1-05).

SECTION VI. BACKWATER GATE, COMPLETE WITH HOIST (Item 14)

6-01. Work included. - The contractor shall design, furnish, and install one timber or metal backwater gate and frame, complete with hoist and accessories, for the Masseek Street sewer as shown on the drawings and specified herein.

6-02. Gate. - The gate shall be designed to close tightly a 5'-0" wide by 5'-9" high rectangular opening in the sewer line against a pressure head of 40 feet of water. The gate shall be properly balanced so as to cause a drop in head, with the sewer flowing full through the gate opening, of not more than one foot, and so that the gate will close and seat itself properly if it is entirely submerged when outflow stops and before backflow starts. The gate shall be provided with a metal eye bolt for hoisting or holding the gate.

6-03. Hoist. - The gate hoist shall be a hand-operated geared winch sufficient in capacity to operate the gate against a 20-foot head.

6-04. Furnishings and fittings. - a. The gate frame, guide, and hoist shall be designed and constructed to provide a satisfactory method of fastening them securely to concrete or other supports during erection as shown on the drawings. All bolts, special tools, and other devices necessary to erect the gate, frame, guide, and hoist as shown on the drawings shall be furnished by the contractor.

b. All bolts, nuts, screws, studs, pins, etc. shall be securely locked by satisfactory devices that will prevent loosening due to vibration.

6-05. Design. - a. The detailed design for the backwater gate, hoist, and accessories shall be such that all working parts shall be readily accessible for inspection and repair, easily duplicated, and readily replaced. Each and every part of the equipment shall be properly designed and suitable for the use and service required.

b. The design stress for any member or part of the material covered by these specifications shall not be greater than one-sixth of the ultimate strength of the material used.

6-06. Drawings. - The contractor shall submit for approval detail drawings for the backwater gate, hoist, and accessories he proposes to install in sufficient detail to check the design. These drawings shall be in accordance with Paragraph 1-04 c and shall include a complete and itemized list of all parts, with the grade and class of material or make of a standard article, which the contractor proposes to furnish. The item number in the list of parts shall be shown on the drawings by means of a circle enclosing the item number and a solid light line connecting the circle to the part. Proposed construction shall be clearly shown on the drawings by the liberal use of sections, enlarged details, or by other means. Any item or part omitted from the drawings or list

of parts, but needed in order to provide a complete and workable installation in accordance with the intent of these specifications, shall be supplied by the contractor the same as if included on the drawings, the list of parts, or in the requirements of these specifications. Approved drawings submitted by the contractor shall become a part of these specifications.

6-07. Materials and workmanship. - a. The gate, with its hoist and accessories, shall be constructed of the grade and class of materials as shown on the "List of Parts" on the design drawings as furnished by the contractor and approved by the contracting officer, and shall conform to the provisions of Section V, where applicable. All metal workmanship shall be of approved standard quality.

b. If of timber construction, the gate and frame shall be made of sound, dense, long-leaf southern pine of the best quality structural grade, creosoted to retain not less than 12 pounds of creosote per cubic foot of lumber. Metal fastenings, eye bolts, hinges, bearings, and anchor bolts shall meet first-class requirements for timber backwater gates in sewers as to strength, durability, wear, and non-corrosion.

6-08. Installation. - The gate shall be completely assembled during installation, and the leaf shall be screwed lightly into its seat and shall be held in place by jack screws. Care shall be exercised when drawing the frame up to the concrete to ensure its being pulled against a true surface. All bolts shall be tightened carefully so as not to strain or warp the parts and to preserve proper alignment. Grout shall be poured between the face of the flange and the concrete to prevent any tendency to spring the frame. After installation, the jack screws shall be removed.

6-09. Inspection and tests. - a. The gate, hoist, and accessories to be furnished shall be assembled in the shop as directed by the contracting officer for inspection and to ensure that all parts fit accurately and are in proper alignment. The gate shall be opened and closed to ensure proper operation.

b. The gate shall be tested for satisfactory operation by being raised and lowered several times for its full length of travel. Any adjustments in the setting or installation required to secure satisfactory operation and tight closure of the gate shall be made by the contractor. The gate hoist shall be tested as directed, and any adjustments or changes which the contracting officer considers necessary shall be done by the contractor.

c. The cost of all testing shall be borne by the contractor, except for the Government's representatives, and shall be included in the contract price for Item 14.

6-10. Painting. - a. Painting shall conform to the applicable provisions of Paragraph 5-03 b, except for woodwork (see Paragraph 6-07 b).

b. For the gate and gate guides there shall be one coat of metal filler, one shop coat of red lead, one field coat of red lead paint, orange in color, and two finish coats of graphite paint. Painting shall be similar or equal to Detroit Graphite Company's Iron-Gard System for underwater steel structures.

c. For the gate hoist there shall be applied one coat of metal filler, one shop coat of red lead, one field touch-up coat of red lead, and two coats of selected engine enamel.

d. The touch-up coat shall be applied as may appear necessary to the contracting officer and shall be done with the same shade as the shop coat.

6-11. Payment. - Payment for designing, furnishing, painting, and installing the work included in Paragraph 6-01 will be made at the contract price for Item 14, "Backwater Gate, Complete with Hoist."

U. S. Engineer Office  
Providence, R. I.  
December 17, 1941

STANDARD GOVERNMENT FORM OF BID

(Construction Contract)

(Place) \_\_\_\_\_

(Date) \_\_\_\_\_

To the District Engineer  
U. S. Engineer Office  
819 Industrial Trust Bldg.  
Providence, R. I.

In compliance with your specifications dated December 17, 1941,  
and subject to all the conditions thereof, the undersigned

\_\_\_\_\_

a corporation organized and existing under the laws of the State of

\_\_\_\_\_,

a partnership consisting of \_\_\_\_\_

\_\_\_\_\_

or an individual trading as \_\_\_\_\_

\_\_\_\_\_

of the city of \_\_\_\_\_

hereby proposes to furnish all plant, labor, and materials, and perform  
all work required for the reconstruction of the Masseek Street Sewer,  
at Hartford, Connecticut, including all work indicated on the drawings  
or required by the specifications, and such incidental work as needed or  
ordered in writing by the contracting officer, in strict accordance with  
the specifications, schedule, and drawings, for the consideration of the  
following prices:



<u>Item No.</u>	<u>Designation</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
1	Common Excavation - General	cu.yd.	6,100		
2	Removal of Existing Structures	job	-		
3	Gravel Bedding	cu.yd.	250		
4	Compacted Backfill	cu.yd.	4,200		
5	Dumped Rock Fill	cu.yd.	500		
6	Reinforced Concrete Pipe	lin.ft.	168		
7	Precast Concrete Sleepers	cu.ft.	850		
8	Cement	bbl.	210		
9	Concrete - Class A	cu.yd.	150		
10	Steel Reinforcement	lb.	13,000		
11	Flap Valves - 12-inch	each	2		
12	Miscellaneous Iron and Steel	lb.	750		
13	Copper Water Stops	lb.	70		
14	Backwater Gate, Complete with Hoist	job	-		
TOTAL					

Note: All amounts and total given above will be subject to verification by the Government. In case of variation between unit bid price and totals shown by bidder, the unit price will be considered to be his bid.

PLANT TO BE USED

(See Paragraph 1-09 of the specifications)

Note:-- Use separate line for each major item.

No.	:	Name	:	Kind	:	Capacity	:	Age and Condition
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Material Handling Equipment

Concreting Equipment

Miscellaneous Equipment

It is hereby warranted that in the event award is made to the undersigned there will be used in the performance of the work covered by the contract only such unmanufactured articles, materials and supplies as have been mined or produced in the United States and only such manufactured articles, materials, and supplies as have been manufactured in the United States all from articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States, except as indicated in this bid or authorized in the specifications.

The undersigned agrees, upon receipt of written notice of the acceptance of this bid within 60 days after the date of opening of the bids, to execute the standard form of Government contract, in accordance with the bid as accepted, and to give the required bonds with good and sufficient surety or sureties for the faithful performance of the contract and for the protection of all persons supplying labor and materials in the prosecution of the work, within 10 days after the proscribed forms are presented for signature.

Performance will begin within 10 calendar days after the receipt of notice to proceed and will be completed within 90 calendar days after date of receipt of said notice to proceed.

\_\_\_\_\_  
(Bidder)

\_\_\_\_\_  
(Address)

By

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Title)

NOTE: - Read Standard Government Instructions to Bidders before preparing this bid.